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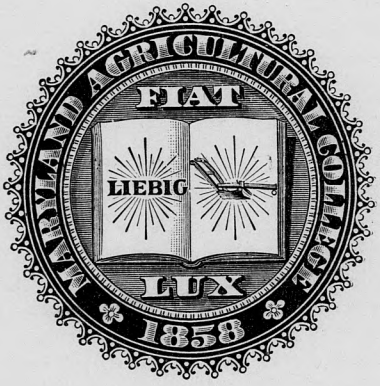

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ADDRESS

Chemical Department, Maryland Agricultural College,

COLLEGE PARK, MD.

ANALYSIS OF FEED STUFFS SOLD IN MARYLAND

BY THE CHEMICAL DEPARTMENT OF THE

MARYLAND AGRICULTURAL COLLEGE.

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In response to the demand of the farmers of the State for the inspection and analysis of feed-stuffs, especially concentrated feeding stuffs, the Legislature has passed the law which is printed in full in this issue of the Quarterly.

Foremost in the movement were the farmer's clubs of Harford County, especially the Norrisville Farmer's Club.

The necessity for such inspection is especially felt in connection with the use of concentrated feeds. These are feeds that are rich in *protein*. Protein is the nitrogenous ingredient of the feed and is the essential constituent for the formation of muscles (lean meat) and many other parts of the animal body which are rich in protein. The ordinary foods of the farm are deficient in this substance and in order to supply the deficiency the farmer and dairyman must resort to concentrated feeds. These are usually by-products, or the residue that remains from some manufacturing industry. Cotton seed meal is the residue of the seed after extracting the oil. Gluten is extracted from the grain in the manufacture of starch, etc.

ANALYSIS OF FOOD.

Foods are analyzed for their proximate components, which in themselves are compounds, and not for the ultimate elements. Foods contain water, protein, either extract, or fat, crude fiber, starch, sugar, ash and some other substances in small amounts.

Water is always present. It may form 80 to 90 per cent., or even more, in green foods or fruits. The ordinary mill-feeds contain, generally, from 5 to 15 per cent. It is important to determine the amount of it present, when making an analysis, if the result is to be compared with other analyses, as the *percentage* of the other constituents vary according to the extent of the drying. Thus, if one takes 100 lbs. of green hay containing 10 lbs. of crude fiber the percentage of fiber is 10. If the hay now loses half of its weight in drying we have but 50 lbs. of the substance left, but 10 lbs. of it is fiber, or one now has *20 per cent.* of fiber. Other substances present, except the water, are effected in the same way. The per cent. of water subtracted from 100 gives the per cent. of dry matter.

Protein, is a term applied to a class of bodies resembling the white of egg. When dried they contain 16 per cent. of nitrogen. The amount of protein is obtained by getting the amount of nitrogen and multiplying this by 6¼. As a little of the nitrogen is present in other compounds than protein, the results obtained in this way are frequently termed *crude protein*.

Ether Extract, consists largely or entirely of fats and oils; it is frequently called *fat* or *crude fat*.

Crude Fiber is the woody framework of the plant. It is insoluble in dilute acids and alkalis, and is less digestible, as a rule, than the other parts of the plant. Paper pulp, cotton, etc., are crude fiber. Fiber, or cellulose, is a carbohydrate.

Ash is the mineral matter or non-combustible part of the food. It goes to make the bones, teeth, etc., of animals.

Nitrogen-free Extract includes the soluble carbohydrates, starch and sugar, and also the organic acids, etc., when present. It forms a large and important part of ordinary foods.

Organic Matter, or combustible matter, includes everything enumerated above except the water and ash.

USES OF FOOD IN THE BODY.

Under the title "Economy of Food," Prof. Atwater, regarding human food—and this applies equally well to cattle food—writes as follows:—

"Food supplies the wants of the body in several ways. It either:—

1. Is used to form the tissues and fluids of the body;
2. Is used to repair the wastes of tissues;
3. Is stored in the body for future consumption;
4. Is consumed as fuel, its potential energy being transformed into heat or muscular energy or other forms of energy required by the body; or
5. In being consumed protects tissues or other food from consumption.

USES OF THE DIFFERENT CLASSES OF NUTRIMENTS.

Protein forms tissue (muscle, tendon, etc., and fat) and serves as fuel.
Fats form fatty tissue (not muscle, etc.,) and serve as fuel.
Carbohydrates are transformed into fat and serve as fuel.

} all yield energy in form of heat and muscular strength.

In being themselves burned to yield energy, the nutrients protect each other from being consumed. The protein and fats of body-tissue are used like those of food. An important use of the carbohydrates and fats is to protect protein (muscle, etc.), from consumption."

The *Nutritive ratio* is the ratio of the digestible protein to the digestible carbohydrates and fat. As fat represents 2¼ times as much energy as an equal weight of either protein or carbohydrates, it is converted to its carbohydrate equivalent by multiplying by this factor. To get the nutritive ratio, multiply the per cent. of digestible fat by 2¼, add the digestible carbohydrates and divide the result by the digestible protein.

In the case of concentrated foods the ratio is "narrow." in ordinary foods the ratio is "wide." (See last column in Table II.)

Careful experiments have shown that the best results are only ob-

tained when the ration conforms, within reasonable limits, to the feeding standards (See Table I).

The ration must be properly "balanced," i. e., have the proper nutritive ratio. Further than this, it must have sufficient bulk to properly distend the digestive organs of the animal,—the ration must contain a certain amount of "organic matter," which is the total amount of the substance less the water and ash.

It is comparatively easy to compound a ration having the proper ratio of protein to carbohydrates and fat, but the third element of bulk complicates the problem considerably. It appears that the ratio which gives the best results in Germany has not been found the best in this country.

Suppose one wishes to compound a ration for dairy cows, weighing 900 pounds each. One finds in the table the amounts of the different food principles for each 100 pounds, and this, of course, to be multiplied by 9 to get the amount per cow. Suppose one wishes to use fodder, corn and wheat bran. If, on first trial, one finds that he has too much protein, the amount of bran is reduced. After a few trials the following is the result:

	Organic Matter.	Digestible Protein.	Digestible Fat and Carbohydrates	Nut Ratio.
22 lbs. Fodder Corn...	12.11 lbs....	.57 lbs....	7.88 lbs....	1:13.3
12 lbs. Wheat Bran....	9.89 lbs....	1.51 lbs....	6.00 lbs....	1: 4.
Total per day...	22.00 lbs.	2.08 lbs.	13.88 lbs.	1: 6.7
Standard	22.05 lbs.	1.98 lbs.	13.41 lbs.	1: 6.8

Frequently a more complex ration will be found necessary. The following from Bulletin No. 64, R. I. Station, will serve as illustrations:—

	Dry Matter.	Digestible Protein.	Digestible Carbohydrates & Fat.	Nutritive Ratio.
(*a*)				
20 lbs. field-cured corn stover....	11.98	.40	6 96	
7 lbs. mixed hay.....	6.00	.33	2.99	
2 lbs. Chicago gluten meal.....	1.81	.55	1.14	
3 lbs. wheat bran.....	2.64	.36	1.36	
1 lb. old process linseed meal...	.91	.29	.49	
Totals.....	23.34	1.93	12.94	1:67
Standard ration.....	22.05	1.98	13.41	1:68
(*b*)				
16 lbs. field-cured corn stover....	9.58	.32	5.57	
6 lbs. red clover hay.....	5.08	.38	2.31	
2 lbs. Chicago gluten meal.....	1.81	.55	1.14	
4 lbs. Indian corn meal	3.40	.22	2.84	
½ lb. old-process linseed meal...	.45	.15	.24	
2½ lbs. wheat bran.....	2.42	.33	1.25	
Totals.....	22.74	1.95	13.35	1.68
Standard ration.....	22.05	1.98	13.41	1.68

We present in Table III the results of some preliminary work in the analysis of feeds stuffs in Maryland and hope to present in our November number a much more extended list.

Table I *Feeding Standards.—Per Day and* 100 *Lbs. Live Weight.*

	Dry Matter. lbs.	Digestible, Lbs.			Nutritive Ratio. 1 : —
		Protein.	Fat x 2½ + Carbohydrates.	Total.	
Milk Cows, Wisconsin standard	2.45	.22	1.49	1.71	6.8
Milk Cows, German standard	2.40	.25	1.34	1.59	5.4
Oxen at rest in stall	1.75	.07	.83	.90	11.9
Oxen moderately worked	2.40	.16	1.20	1.36	7.5
Oxen heavily worked	2.60	.24	1.43	1.67	6.0
Oxen, fattening, preliminary period	2.70	.25	1.61	1.86	6.4
Oxen, fattening, main period	2.60	.30	1.64	1.94	5.5
Oxen, fattening, finishing period	2.50	.27	1.62	1 89	6.0
Wool Sheep, coarser breeds	2.00	.12	1 08	1.20	9.0
Wool Sheep, finer breeds	2.25	.15	1.20	1.35	8.0
Horses lightly worked	2.00	.15	1.04	1.19	6.9
Horses moderately worked	2.10	.17	1.18	1.35	6.9
Horses heavily worked	2.30	.23	1.43	1.66	6.2
Fattening Sheep, preliminary period	2.60	.30	1 63	1.93	5.4
Fattening Sheep, main period	2.50	.35	1.58	1.93	4.5
Fattening Swine, preliminary period	3.60	.50	2.75	3.25	5.5
Fattening Swine, main period	3.10	.40	2.40	2.80	6.0
Fattening Swine, finishing period	2.35	.27	1.75	2.02	6.5
Growing Fat Swine, 2-3 months	4 20	.75	3.00	3.75	4.0
Growing Fat Swine, 3-5 months	3.40	.50	2.50	3.00	5.0
Growing Fat Swine, 5-6 months	3.15	.43	2.37	2.80	5.5
Growing Fat Swine, 6-8 months	2.70	.34	2.04	2.38	6.0
Growing Fat Swine, 8-12 months	2.10	.25	1.62	1.87	6.5
Growing Cattle, age 2-3 months	2.20	.40	1.83	2.23	4.6
Growing Cattle, age 3-6 months	2.34	.32	1.58	1.90	4.9
Growing Cattle, age 6-12 months	2.40	.25	1.49	1.74	6.0
Growing Cattle, age 12-18 months	2.40	.20	1.39	1.59	7.0
Growing Cattle, age 18-24 months	2.40	.16	1.27	1.43	8.0
Growing Sheep, age 5-6 months	2.80	.32	1 74	2 06	5.4
Growing Sheep, age 6-8	2.50	.27	1.47	1.74	5.4
Growing Sheep, age 8-11	2.30	.21	1.25	1.46	6 0
Growing Sheep, age 11-15	2.25	.17	1.18	1.35	7.0
Growing Sheep, age 15-20	2.20	.14	1.11	1.25	8.0

Table II.—*Average Composition of American Feeding Stuffs, (From Compilations of Jenkins, Winton and Woll.)*

FEEDING STUFFS.	PERCENTAGE COMPOSITION.								PER CENT. DIGESTIBLE MATTER.			NUTRITIVE RATIO.
	No. of Analyses.	Water.	Crude Protein.	Crude Fiber.	Nitrogen Free Extract.	Ether Extract.	Organic Matter.	Ash.	Crude Protein.	Carbohydrates.	Ether Extract.	1 : —
Green Fodders and Silage	...	....	....	....	....	...	....	...	...	....	...	....
Alfalfa (lucern)	23	71.8	4.8	7.4	12.3	1.0	25.5	2.7	3 6	11.4	.4	1 : 3.4
Alsike Clover in Bloom	4	74 8	3.9	7 4	11.0	.9	23 2	2.0	2.7	13.1	.6	5.3
Barley Straw	97	14.2	3 5	36.0	39.	1.5	80.1	5.7	.9	41.3	.6	47.3
Blue Grass	81	65.1	4.1	9.1	17.6	1.3	32.1	2.8	2.9	19.2	.8	7.2
Buckwheat Straw	3	9.9	5.2	43.0	35.1	1.3	84 6	5.5	2.3	37.7	.6	16.9
Corn Silage	99	79.1	1 7	6.0	11.1	.8	19.5	1.4	.8	11.6	.7	16.3
Corn Silage, Wis. Analysis	17	73.6	2.7	7.8	12.9	.9	24.2	2 1	1 3	14.0	.7	11.9
Clover Silage	5	72.0	4.2	8.4	11.6	1.2	25.4	2 6	2.0	13.5	1.0	7.8
Corn Stalks (field cured)	60	40.1	3.8	19.7	31.9	1.1	56.5	3 4	2 0	33 4	.6	17.3
Fodder Corn (maize)	35	42.2	4.5	14.3	34.7	1.6	55.1	2 7	2.6	33.3	1.1	13.3
Same, Wis. Analysis	5	29.0	6.5	22 1	36.5	1.7	66 8	4.2	3.7	40 4	1.2	11.6
Green Fodder Corn (maize)	126	79.3	1.8	5.0	12.2	.5	19.5	1.2	1.3	11.8	.4	9.7
Green Clover	43	70 8	4 4	8 1	13.5	1.1	27.1	2.1	2.9	14.1	.7	5.3
Hay from Red Clover	38	15.3	12.3	24.8	38.1	3.3	78.5	6 2	6.5	34 9	1.6	5.5
Hay from Mammoth Clover	10	21.2	10.7	24.5	33 6	3 9	72 7	6.1	5 7	32 0	1.9	6.3
Hay from Alfalfa (lucern)	21	8.4	14.3	25.0	42.7	2.2	84.2	7.4	7.6	37.8	1.3	5.3
Hay from Alsike Clover	9	9.7	12.8	25.6	40.7	2 9	82.0	8.3	6.8	36 8	1.4	5.8
Hay from Mixed Meadow Grasses	11	16.0	6.4	29.9	41.0	2 1	79.4	4.6	3.6	42.7	1 0	12.4
Hay from Hun. Grass	12	7.7	7 5	27 7	49 0	2.1	86.3	6.0	4.5	46.4	1 0	10.8
Marsh Hay	2	7.9	7.8	30.1	46.3	2.7	86 9	5.2	3.5	44.7	1.7	13 8
Meadow Fescue in Bloom	4	69.9	2.4	10.8	14.3	8	28.3	1 8	1.7	17.8	.5	11.1
Oat Fodder	5	62 2	3.4	11.2	19.3	1 4	35.3	2.5	2.7	22.7	1.0	9.2
Oat Hay	6	8.9	7.6	29 3	45.1	2.9	84 9	6.2	4.3	46.4	1.5	11.6
Oat Straw	12	9.3	4.0	37.0	42.4	2.3	85.7	5.1	1.6	41.4	.7	26.8

Average Composition of American Feeding Stuffs (Continued.)

Oat Straw	12	9.3	4.0	37.0	42.4	2.3	85.7	5.1	1.6	41.4	.7	20.3

Average Composition of American Feeding Stuffs, (Continued.)

FEEDING STUFFS.	PERCENTAGE COMPOSITION.								PER CENT. DIGESTIBLE MATTER.			NUTRITIVE RATIO.
	No. of Analyses.	Water.	Crude Protein.	Crude Fiber.	Nitrogen Free Extract.	Ether Extract	Organic Matter.	Ash.	Crude Protein.	Carbohydrates.	Ether Extract.	1 : —
Pasture Grass	....	80 0	3.5	4.0	9.7	.8	18 0	2.0	2.6	10.6	.5	1 : 4.5
Pea Vine	14	13.6	9.0	35.5	33.7	1 6	79 8	6.6	4.3	32.3	.8	7.9
Prickly Comfrey	41	88 4	2.4	1.6	5.1	.3	9 4	2.2	1.4	4 6	.2	3.5
Red Top in Bloom	5	64.8	3.3	9.4	19 1	1.2	32.9	2.3	2.3	20.5	.7	9.5
Rye Fodder	7	76.6	2.6	11.6	6.8	.6	21.6	1 8	2.1	14.1	.4	5.1
Rye Straw	7	7.1	3.0	38.9	46 6	1.2	89.7	3 2	.8	42.7	.4	54.5
Sorghum Fodder	11	79 4	1 3	6.1	11.6	.5	19.5	1.1	.8	12.7	.4	17.0
Sorghum Silage	6	76.1	.8	6 4	15.3	.3	22 8	1.1	.6	14.9	.2	25.5
Timothy	56	61.6	3.1	11 8	20.2	1.2	36.3	2.1	2.2	23.0	.7	11.1
Timothy Hay	68	13.2	5.9	29 0	45 0	2.5	82.4	4.4	3.0	43 9	1.2	15.5
Wheat Straw	7	9 6	3.4	38 1	43.4	1.3	86 2	4 2	.8	37.9	.5	48 7
Barley	10	10.9	12.4	2.7	69.8	1.8	86.7	2.4	9.5	66.1	1.2	7.2
Barley Screenings	2	12.2	12.3	7.3	61.8	2.8	84.2	3.6	9.3	57.3	1.8	6.5
Buckwheat	8	12 6	10.0	8.7	64.5	2.2	85.4	2 0	7.7	49.2	1 8	6.9
Buckwheat Bran	2	10.5	12 4	31.9	38 8	3.3	86.5	3.0	7.4	30.4	1.9	4.6
Buckwheat Shorts	2	11.1	27.1	8.3	40.8	7 6	83 8	5.1	21.1	33.5	5 5	2 3
Buckwheat Middlings	6	12.7	28.2	4 2	42.3	7.5	82 2	5.1	22.0	33.4	5.4	2 0
Carrots	8	88.6	1.1	1.3	7.6	.4	10.4	1 0	1.0	7.1	.3	7.7
Corn (maize)	208	10.9	10.5	2.1	69.6	5.4	87 6	1.5	6.3	64.8	5.0	12.0
Corn and Cob Meal	7	15 1	8 5	6 6	64 8	3.5	83.4	1.5	6.5	56.3	2.9	9.6
Corn Cob	18	10 7	2.4	30.1	54.9	5	87.9	1.4	1.6	43 9	.3	27.8
Corn Bran (hulls)	5	9 1	9.0	12.7	62.2	5.8	89.6	1.3	7.4	59.8	4.6	9.4
Low Grade Flour ("Red Dog")	8	10 0	15.8	1.6	67.7	2.7	87.8	2.2	13.5	61 3	2.0	4.8
Mangel Wurzels	9	90.9	1.4	.9	5 5	.2	8.0	1.1	1.1	4.8	.2	4.7
Oats	30	11.0	11.8	9.5	59.7	5.0	86.0	3.0	9.1	44.7	4.1	5.9

Average Composition of American Feeding Stuffs, (Continued.)

FEEDING STUFFS.	PERCENTAGE COMPOSITION.								PER CENT. DIGESTIBLE MATTER			NUTRITIVE RATIO.
	No. of Analyses	Water.	Crude Protein.	Crude Fiber.	Nitrogen. Free Extract.	Ether Extract.	Organic Matter.	Ash.	Crude Protein.	Carbohydrates.	Ether Extract.	1 : —
Oat Shorts	6	10.0	16.2	7.5	54.5	6.6	84 8	5.2	12.6	45 7	5.4	1 : 4.5
Oat Feed	4	7.7	16.0	6.1	59.4	7.1	88.6	3.7	12.9	46.9	2 8	4.2
Oat Dust	2	6.5	13.5	18.2	50.2	4 8	86.6	6.9	8.9	38.4	5.1	5.6
Potatoes	12	78.9	2.1	.6	17.3	.1	20.1	1.0	1 4	16.1	.1	11.6
Pea Meal	2	10.5	20.2	14.4	51.1	1.2	86.9	2 6	18.0	56.0	.9	3.2
Red Beets	9	88 5	1.5	.9	8.0	.1	10 5	1.0	.9	7.6	.1	8.6
Rutabagas	4	88.6	1.2	1.3	7.5	.2	10.2	1.2	.9	7.1	.2	8.6
Rye	6	11.6	10.6	1.7	72 5	1.7	86 5	1 9	8.3	65.5	1.2	8.2
Rye Bran	7	11.6	14.7	3 5	63.8	2.8	84.8	3.6	9.7	48.0	1.6	5.3
Rye Shorts	1	9.3	18.0	5.1	59.9	2.8	85.8	5.9	11.9	45.1	1.6	4.0
Rice	10	12 4	7.4	.2	79.2	.4	87.2	.4	4.8	72 2	.3	15.1
Rice Bran	5	9.7	12.1	9.5	49.9	8.8	80.3	10.0	5.3	45.1	7.3	11 6
Rice Hulls	3	8.2	3.6	35.7	38.6	.7	78.6	13 2	1.6	44.5	.6	28.6
Rice Polish	4	10.0	11.7	6 3	58 0	7 3	83.3	6 7	9.0	56.4	6.5	7.8
Sweet Potatoes	6	71.1	1 5	1.3	24.7	.4	27.9	1.0	.9	22.2	.3	25.4
Sugar Beets	19	86.5	1.8	.9	9.8	.1	12 6	.9	1.1	9.3	.1	8 6
Turnips	3	90 5	1 1	1.2	6.2	.2	8 7	.8	.6	5.5	.2	9.9
Wheat	310	10.5	11.9	1.8	71.9	2.1	87.7	1.8	9 2	64.9	1.4	7.3
Wheat Bran (roller process)	7	12.0	16.1	8.4	53.7	4 2	82.4	5.6	12.6	44.1	2.9	4.0
Wheat Bran (old process)	9	12 0	13.0	8 1	58.2	3.8	83.1	4 9	10.1	47.5	2 6	5.2
Wheat Shorts	12	11.8	14.9	7.4	56.8	4.5	83 6	4 6	11.6	45.4	3.2	4.5
Wheat Middlings	33	12.1	15.7	4.7	60.2	4.0	84.5	3.4	12.2	47 2	2 9	4.4
Wheat Screenings	10	11.6	12 5	4.9	65.1	3.0	85.5	2.9	9.8	51.0	2.2	5.7
Brewers' Grains (wet)	15	75.7	5.4	3 8	12.5	1.6	23.3	1.0	3.9	9.5	1.3	3.1
Brewers' Grains (dried)	5	7.7	22.2	12.3	47.9	6.3	88.7	3.6	16.2	35.5	5.3	3.0

Brewers' Grains (wet)												
Brewers' Grains (dried)	5	7.7	22.2	12.3	47.9	6.3	88.7	3.6	16.2	35.5	5.3	3.0

Average Composition of American Feeding Stuffs, (Continued.)

FEEDING STUFFS.	No. of Analyses.	Percentage Composition. Water.	Crude Protein	Crude Fiber.	Nitrogen Free Extract.	Ether Extract.	Organic Matter.	Ash.	Per Cent. Digestible Matter. Crude Protein.	Carbohydrates.	Ether Extract	Nutritive Ratio. 1 : —
Buttermilk	85	90.1	4.0	....	4.0	1.1	9.2	.7	3.9	4.0	1.1	1 : 1.7
Cow pea	5	14 8	20.8	4.1	55 7	1.4	82.0	3 2	18.3	54.2	1.1	3.0
Cream gluten meal	5	8 2	32 8	1.7	42.0	14.1	90.5	1.3	29.5	39.6	12.8	3.6
Chicago gluten meal	3	9.5	35.8	1.5	46 8	5 6	89 6	.9	32.2	44.1	5.1	1.7
Corn oil cake	3	9 0	24.8	6.7	43.6	13.5	88 6	2.4	22.3	42.6	12 6	21.4
Cottonseed meal	37	8 2	42.4	5.6	23 8	12 9	84 6	7 2	36.9	18.1	12.3	1.2
Cottonseed hulls	10	9.9	4 2	47.4	33.2	2.2	87.2	2.9	1.0	26.2	1.8	30.2
Dried blood	3	8.5	84 4	....	....	2.5	86.8	4.7	58.1	....	2 3	.8
Gluten meal	7	8.3	21.6	6.8	49 6	12.7	90.8	.9	18 6	48.3	11.1	3.9
Germ meal (corn germ)	4	10.4	10.0	5.0	64.2	6 8	86.0	3.6	9.0	61 2	6 2	8.3
Grano-gluten	3	5 7	31.0	11.4	34.8	14 2	91.6	2 7	26 7	38.8	12.4	2.4
Hominy chops (meal)	14	10.9	9.9	3.7	64.4	8.5	86 6	2.5	8.9	61.0	7.8	8.8
Linseed meal (old process)	21	9.2	32.9	8.9	35.4	7.9	85.1	5.7	28 3	32.8	7.1	1.7
Linseed meal (new process)	14	10 1	33.2	9.5	38.5	3.0	84.1	5.8	27.2	32.9	2.7	1.4
Malt sprouts	5	9.6	24.8	11.0	47.0	1.7	84.5	5 9	19 8	36.2	1.7	2.0
Meat scraps	144	10.7	71.2	....	.3	13 7	85.2	4.1	68 4	.3	13.5	.4
Palm nut meal		10.4	16 8	24.0	35 0	9.5	85.3	4.3	16.0	52 6	9.0	4.5
Sorghum seed	10	12.8	9.1	2.6	69.8	3.6	85.1	2.1	7.0	52.1	3.1	8.4
Soja bean	8	10.8	34.0	4.8	28 8	16.9	84.5	4.7	29.6	17.9	15.9	1.4
Skimmed milk	96	90.4	3.3	....	4.7	.8	8.9	.7	3.1	4.7	.8	2.0
Whey	46	93.4	.9	....	4.8	.3	5.9	.7	.8	4.7	.3	6.7

Table III.—*Analysis of Feed Stuff at the Maryland Agricultural College.*

No.	Name of Manufacturer or Agent.	Name of Food Stuff.
6810	The American Serial Co., Akron, O.....	Schumacker's Stock Feed. (Corn, Oats and Barley.)
6811	The American Serial Co., Akron, O.....	Quaker Dairy Food.....
6812	Byer & Heard, Hagerstown, Md.....	Bran.....
6813	Byer & Heard, Hagerstown, Md.....	Middlings.....
6829	Clawson Bros., Philadelphia, Pa.....	O. Speddin, (Agent.).....
6801	B. F. Crabbs, Laurel, Md.....	Fine Siftings from Ground Corn
6814	City Milling Co., Frederick, Md.....	Middlings.....
6803	Isaac Emmort, Funkstown, Md.....	Bran.....
6804	Emmort Bros., Hagerstown, Md.....	Bran.....
6805	Emmort Bros., Hagerstown, Md.....	Middlings.....
6815	Frederick City Milling Co., Fred'k, Md.	Bran.....
6816	Frederick City Mills, Frederick, Md.....	Middlings.....
6818	Frederick City Mills, Frederick, Md.....	Bran.....
6819	Frederick City Mills, Frederick, Md.....	Corn Meal.....
6820	Frederick City Mills, Frederick, Md.....	Ground Rye.....
6821	Frederick City Mills, Frederick, Md.....	Ground Corn and Cob.....
6800	C. A. Gambrill Co., Ellicott City, Md....	Middlings.....
6802	G. E. Gee Grain Co., Minneapolis, Minn.	Bran.....
6823	N. I. Gorsuch & Son, Westminster, Md.	Bran.....
6826	N. I. Gorsuch & Son, Westminster, Md..	Corn (Shelled) Chops.....
6824	N. I. Gorsuch & Son, Westminster, Md	Middlings.....
6827	G. W. Goodrich & Son Co., Milwaukee, Wis.	Oil Cake Meal.....
6817	Isaac Harder & Co., Toledo, O.....	Middlings.....
6822	Morton Tin Plate Co , Baltimore, Md....	Bran.....
6828	Pratt Food Co., Philadelphia, Pa.....	Pratt's Food for Horses and Cows.
6806	D. A. Stickell, Hagerstown, Md.....	Bran.....
6807	D. A. Stickell.....	Middlings.....
6808	D. A. Stickell.....	Corn Meal.....
6309	D. A. Stickell.....	Corn Meal.....
6825	Smith, Younghling & Co., Westminster, Md.	Corn Meal.....

Table Continued from Opposite Page.

Place of Sampling.	Protein Nx6.25.	Fat or Ether Extract.	Crude Fibre.	Water.
Hagerstown	17.87	3.83	0.97	10.81
Hagerstown	10.62	3.77	22.10	7.06
Hagerstown	17.81	3 60	8.93	10.32
Hagerstown	16.25	3.47	3.48	9.04
Cambridge	27.36	16 44	9.72	7.57
Laurel	8 12	1.13	1.75	13.62
Frederick	21.19	6.14	4.23	8 93
Hagerstown	17.37	3 20	9.88	10 26
Hagerstown	17.50	3.67	8.73	10 20
Hagerstown	17 06	3.61	2.95	9.23
Frederick	15.69	3.73	11.56	11 15
Frederick	14 62	3.39	2.77	10.17
Frederick	14.25	2.25	7.80	10 10
Frederick	8 37	4.53	1.22	9.46
Frederick	11.75	2.01	2 56	10.89
Frederick	9.83	4.08	3.11	11.53
Laurel	16.50	4.39	4.26	10 25
Laurel	15.62	4.84	8.67	10.64
Westminster	16.50	2.87	9.31	10.42
Westminster	9.43	3.98	1.15	9.34
Westminster	15.25	3.62	3.91	10.06
Westminster	36.37	6.65	7.27	8.21
Frederick	16.06	4.46	7.04	9.26
Linwood	15.68	8.90	8.93	6.04
Germantown	15.43	6 28	5.72	7.76
Hagerstown	18.13	2 79	.....	10.52
Hagerstown	16.56	3.44	1.91	9.91
Hagerstown	10 75	1.90	8.51	10.42
Hagerstown	8.62	2.43	3 52	10 03
Westminster	9.18	3.36	1.37	11.30

FEED STUFF LAW OF MARYLAND.

Section 1. Be it enacted by the General Assembly of Maryland, That the following new Sections be added to Article 48 of the Code of Public General Laws, title "Inspections," under the new sub-title, "Feed Stuffs," to follow Section 83, and to be known as Sections 84, 85, 86, 87, 88, 89, 90, 91 and 92, and to read as follows:

84. Every manufacturer, company or person who shall sell, offer or expose for sale or for distribution in this State any concentrated commercial feeding stuff as defined in the following section of this sub-title, used for feeding farm live stock and poultry, shall affix to every package of such feeding stuff, in a conspicuous place, on the outside thereof, a plainly printed statement, clearly and truly certifying the number of net pounds in the package sold or offered for sale, the name or trade-mark under which the article is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business, the source of the food principles, and a chemical analysis stating the percentage of crude protein, allowing one per cent. of nitrogen to equal six and one-fourth of protein, and of crude fat it contains, both constituents to be determined by the method adopted, at the time, by the Association of Official Agricultural Chemists.

85. The term concentrated commercial feeding stuff, as here used, shall not include hays and straws, the whole seeds nor the unmixed meals made directly from the entire grains of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn. Neither shall it include wheat, rye and buckwheat brans or middlings, not mixed with other substance, but sold separately, as distinct articles of commerce, nor pure grain ground together. The agent of the State hereinafter authorized to make those inspections, is fully empowered to take samples of these excepted articles when found, and, if upon analysis, they prove to be adulterated, the vender shall be in all respects subject to the penalties hereinafter set forth for the adulteration of concentrated commercial feeding stuff.

86. The term concentrated commercial feeding stuff, as here used, shall include linseed meals, cotton-seed meals, cotton-seed hulls, pea meals, cocoanut meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried brewer's grains, malt sprouts, hominy feeds, cereline feeds, rice meals, oat feeds, corn and oat chops, ground beef, fish or animal meals, mixed feeds, all patented or trade-marked foods and all other materials of similar nature not included within the preceding Section of this sub-title.

87. Before any manufacturer, company or person shall sell, offer or expose for sale in this State any concentrated commercial feeding stuff, as defined in the preceding Section of this sub-title, he or they shall for each and every feeding stuff bearing a distinguishing name or trade-mark, file with the State Chemist of the Maryland Agricultural College, a certified copy of the statement named in Section 84 of this sub-title; said certified copy to be accompanied, when the State

Chemist shall so request, by a sealed package containing at least one pound of the feeding stuff to be sold or offered for sale, and the company or person furnishing said sample shall thereupon make affidavit that said samples correspond within reasonable limits to the feeding stuff which it represents in the percentage of protein and fat which it contains.

88. Before any concentrated commercial feeding stuff, as defined in Section eighty-six of this Act is sold, offered or exposed for sale in this State, the manufacturer, importer, agent or seller thereof shall pay to the Treasurer of the Maryland Agricultural College an inspection fee of twenty dollars for each brand or kind of concentrated commercial feeding stuff contemplated to be sold, and shall receive therefor from said treasurer a license to sell such brand of concentrated commercial feeding stuff until the first day of July next following; provided that when any manufacturer, importer or dealer shall have paid the inspection fee as herein provided, it shall not be necessary for any other person, as his agent or representative, to pay said fee.

89. Any manufacturer, importer or person who shall sell, offer or expose for sale or for distribution in this State any concentrated commercial feeding stuff, as defined in Section 86 of this Act, without complying with the requirements of the preceding sections of this subtitle, or any feeding stuff which contains substantially a smaller percentage of constituents than are certified to be contained shall, on conviction in a court of competent jurisdiction, be fined not more than one hundred dollars for the first offense, and not more than two hundred dollars for each subsequent offense.

90. The State Chemist of the Maryland Agricultural College shall annually analyze, or cause to be analyzed, at least one sample (to be taken in the manner hereinafter prescribed) of every concentrated feeding stuff sold or offered for sale under the provisions of this subtitle; said State Chemist is hereby authorized and directed in person, or by deputy, to take a sample, not exceeding two pounds in weight, for said analysis, from any lot or package of concentrated commercial feeding stuff, which may be in the possesion of any manufacturer, importer, agent or dealer, or in *transitu* in this State. The result of the analysis of the sample or samples so procured, together with such additional information as circumstances advise, shall be published in reports or bulletins from time to time.

91. Any person who shall obstruct the State Chemist or his deputy, when in the discharge of his duty, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine of not less than one hundred ($100) dollars, or more than five hundred ($500) dollars, or by imprisonment for not less than one month or more than six months, or by both such fine and imprisonment.

92. Whenever the State Chemist becomes cognizant of the violation of any of the provisions of this sub-title he shall report such violation to the State's Attorney having jurisdiction, who shall prosecute the party or parties thus reported, but it shall be the duty of said State Chemist to notify the manufacturer, importer or dealer in writing, before reporting same to State's Attorney, and give him not less than thirty days thereafter in which to comply with the requirements

of this sub-title, but there shall be no prosecution in relation to the quality of any concentrated commercial feeding stuff if the same shall be found substantially equivalent to the certified statement named in Section 87 of this sub-title.

Approved April 5, 1900.

JOHN WALTER SMITH, Governor.

JOHN HUBNER, President of the Senate.

LLOYD WILKINSON, Speaker of the House of Delegates.

INFORMATION CONCERNING THE CHEMICAL DEPARTMENT.

The Chemical Department of the College occupies a commodious brick building, which was specially designed for its accommodation. The building contains six laboratories, (three of which are for the use of students and three for State work), lecture room, supply room, balance rooms and office, also basement for boiler, furnaces, stores, etc.

The work is conducted by the professor of chemistry, who is State chemist, and six assistants.

The official State work consists of inspection and analysis of fertilizers and feed stuff, the latter just begun.

The assistants are detailed from the laboratory from time to time to act as inspectors and sampling agents, getting samples from railroad stations, steamboat wharves, warehouses, etc. These samples are sent to the laboratory and at least one sample of each brand is analyzed every season.

Farmers (who are not manufacturers of, or agents for fertilizers) have the privilege of sending samples of fertilizers for analysis free of charge, provided the samples are drawn and sent as required by the law. Blanks and full instructions will be sent for the asking. Full information in regard to the samples is required so that the results may aid in the work of inspection and may be published for the benefit of other farmers, if the results seem to be of sufficient importance to warrant it. This use of the results does not detract from the value of the results to the party sending the sample to whom a report is sent as soon as the analysis is completed. Analysis of all regular samples of regular brands of fertilizers are published, those of special mixtures are usually not published. Reports of analysis are always sent to the manufacturers before they are published to allow an opportunity for protest if they claim an error in the analysis or sample. In such an event the case is investigated and, if the department is satisfied that no error has been made after the goods left the factory, the analysis is published. If it is a plain case of error, as when sulphate of potash is

shipped instead of ground bone, or muriate of potash in the original bags, instead of nitrate of soda, the matter is dropped.

The analyses of fertilizers are published in the Quarterly twice a year—in February and August. The May and November numbers are devoted mainly to the publication of analysis of feed stuff and other subjects.

We have not yet made arrangements to receive samples of feed stuff from consumers, but may do so later.

The department is anxious to aid the farmers of the State by naming minerals and determining by qualitative tests if they have commercial value. Full information should be given in regard to such samples and questions to be answered made as definite as possible, e. g. "Is the bright substance in this stone gold?" "Is this mineral lead ore?" "What is this mineral and has it any value?" etc. We claim the right to publish any results, if of sufficient interest to warrant it. We cannot undertake to make expensive quantitative analysis for purely personal and business reasons, and cannot undertake to analyze soils, water, mineral water and limestone, or make assays of supposed gold ore.

The Quarterly is sent free to all who apply for it.

Address,

Chemical Department, Maryland Agr'l College,

College Park, Md.

CONTENTS OF THIS NUMBER.

	Page.
Explanation of terms used in food analysis	2
Uses of food	3
Compounding rations	4
Feeding standards, table of	5
Average composition of feeding stuffs	6, 7, 8, 9
Analysis of feed stuffs at the College	10, 11
The feed stuff law	12, 13
Information concerning the Chemical Department	14, 15
College advertisement	16

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R. W. SILVESTER,

President Maryland Agricultural College,

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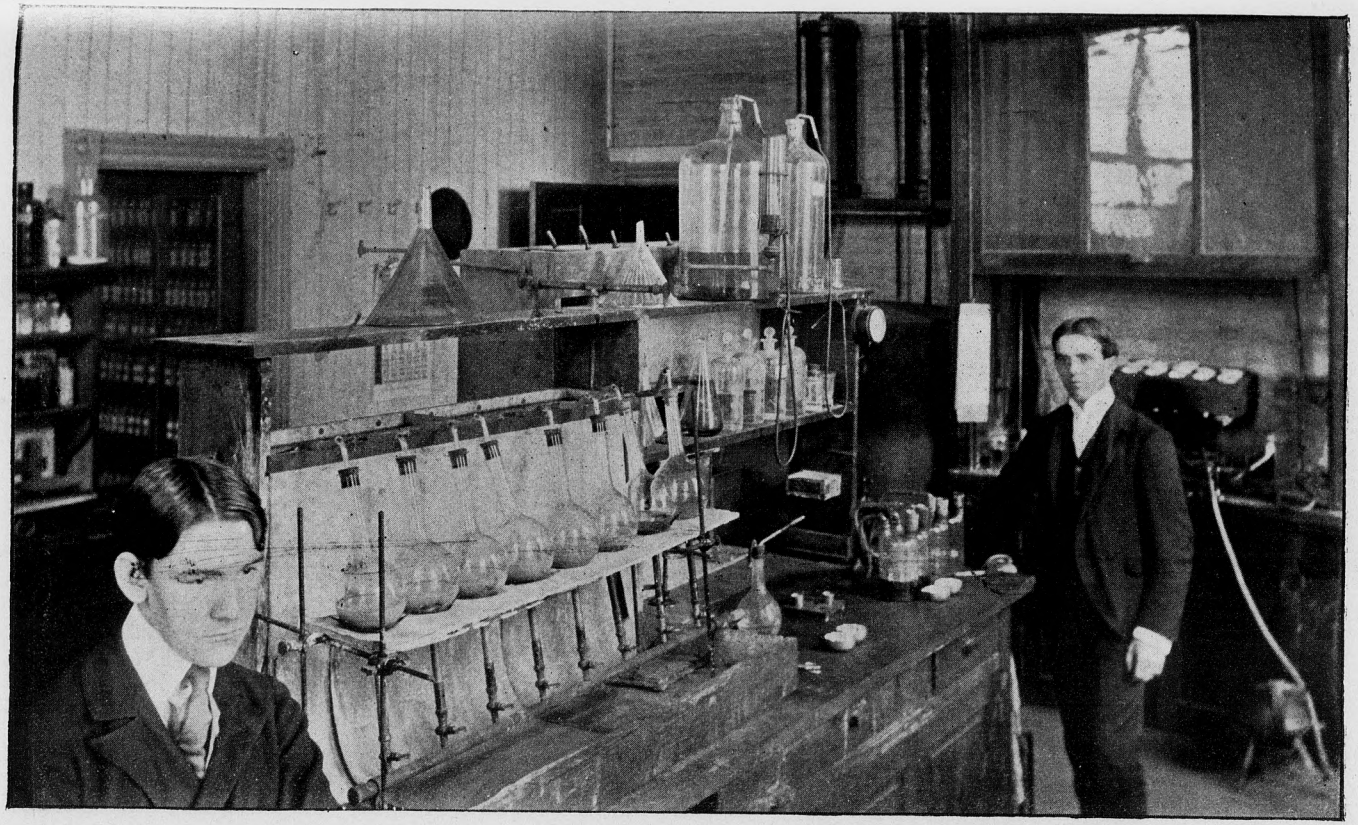

Chemical Laboratory for Nitrogen and Potash Determinations—State Work.

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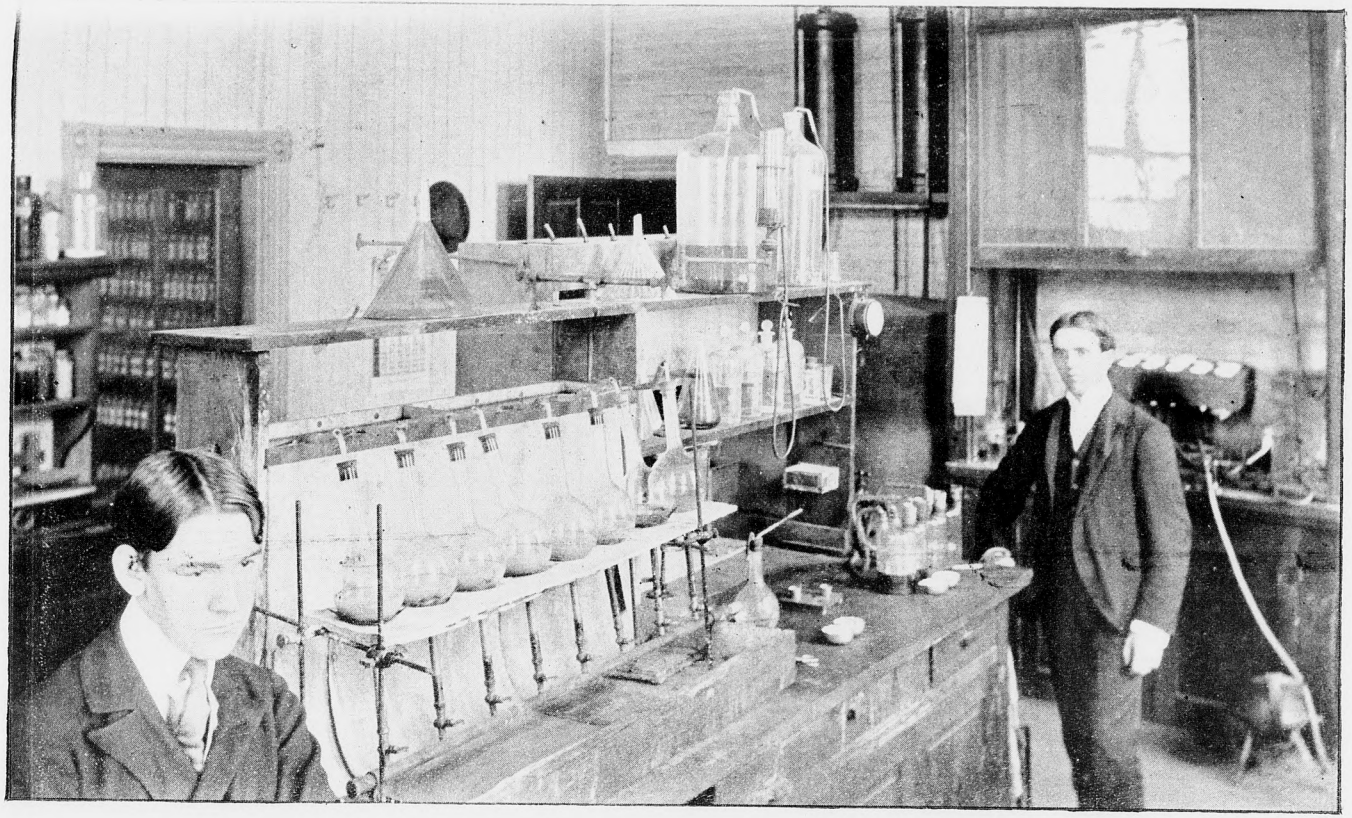

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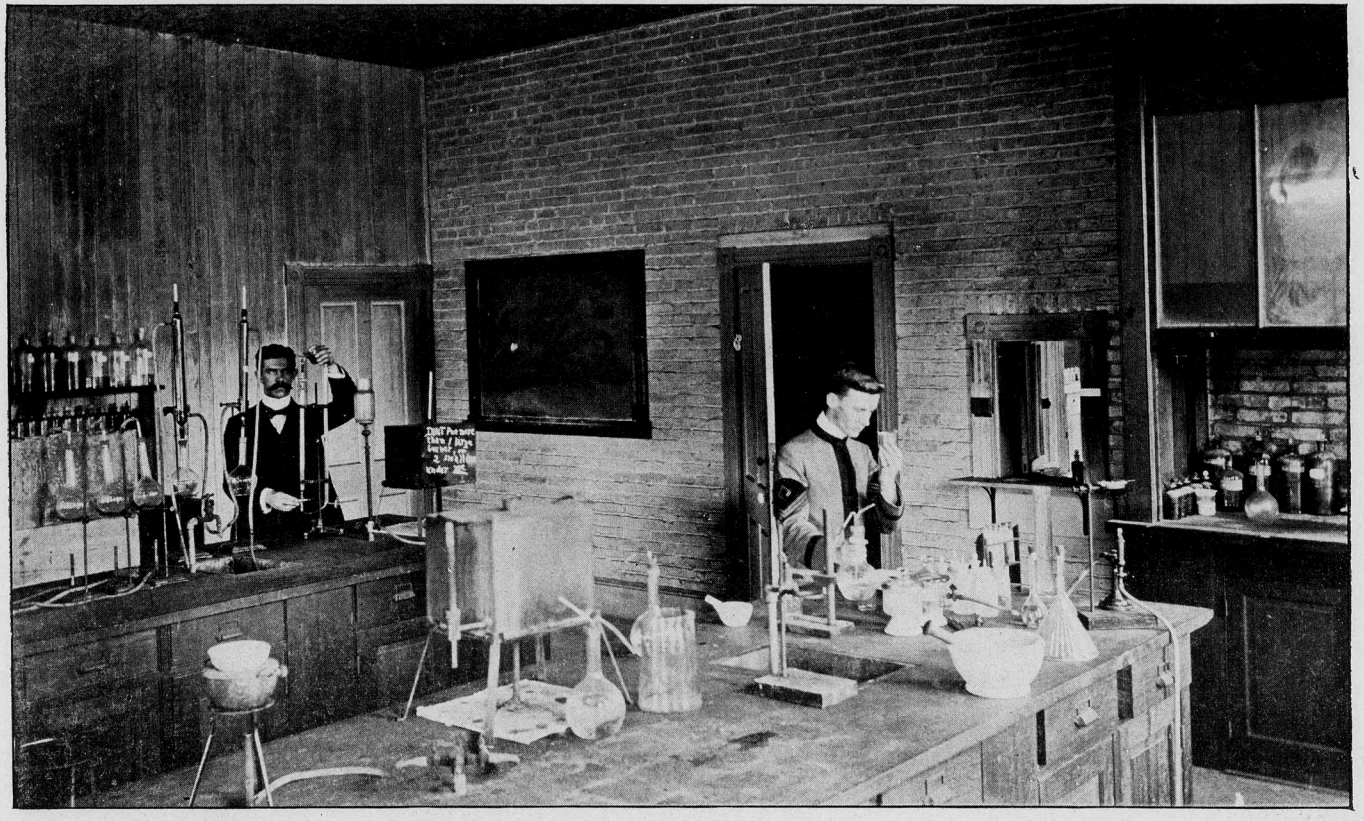
Botanical Laboratory— Students at Work.

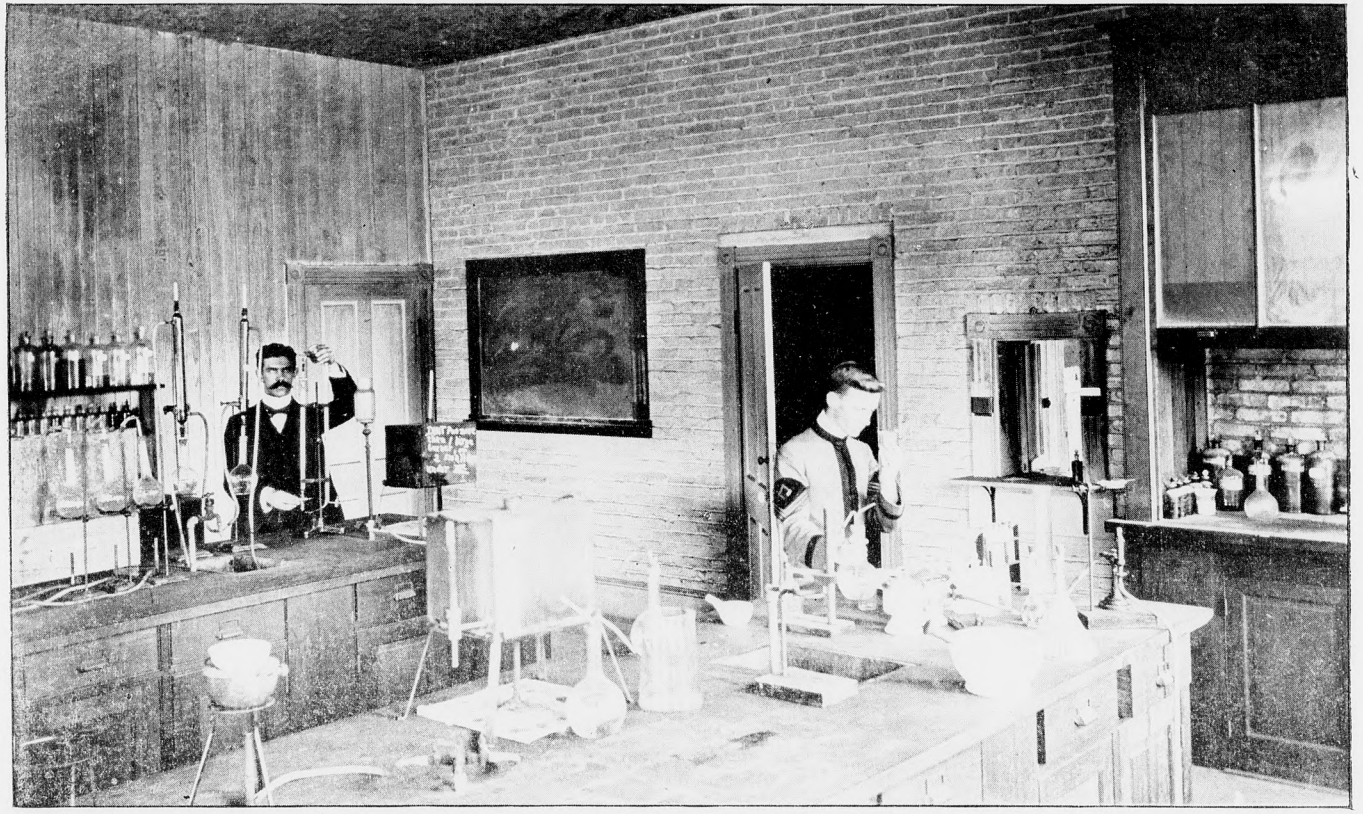
Botanical Laboratory



Junior Chemical Laboratory—Section of Class at Work.

Botanical Laboratory— Students at Work.

Botanical Laboratory



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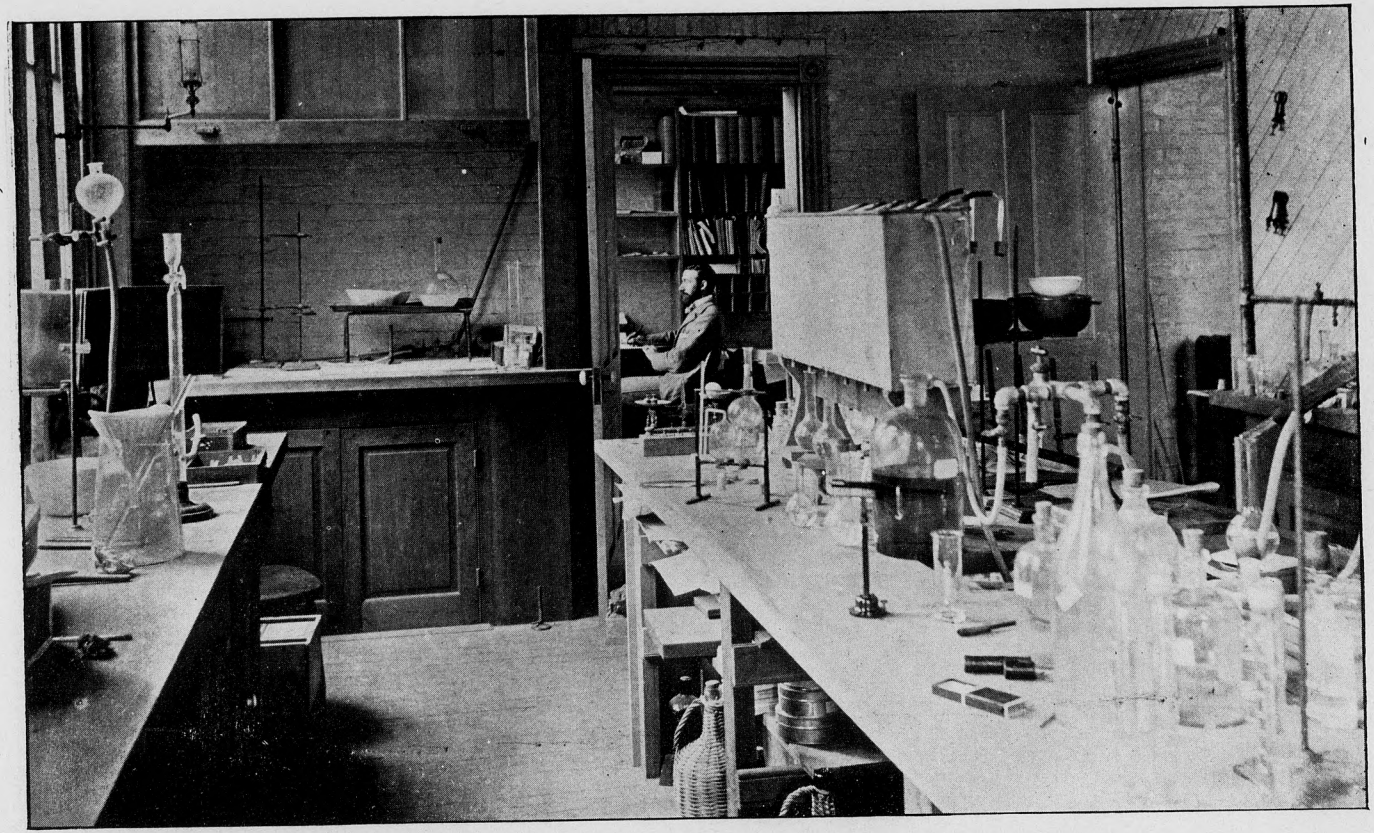

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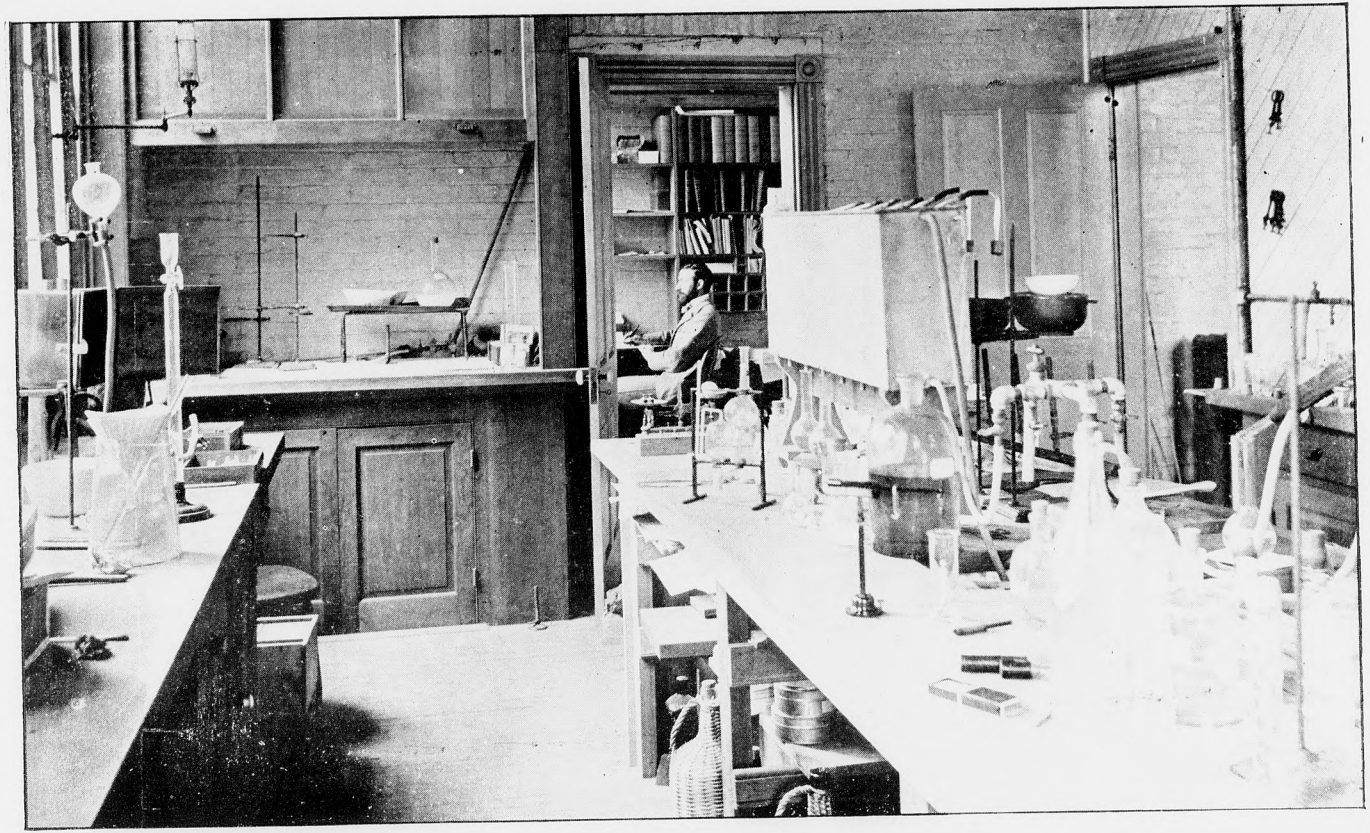

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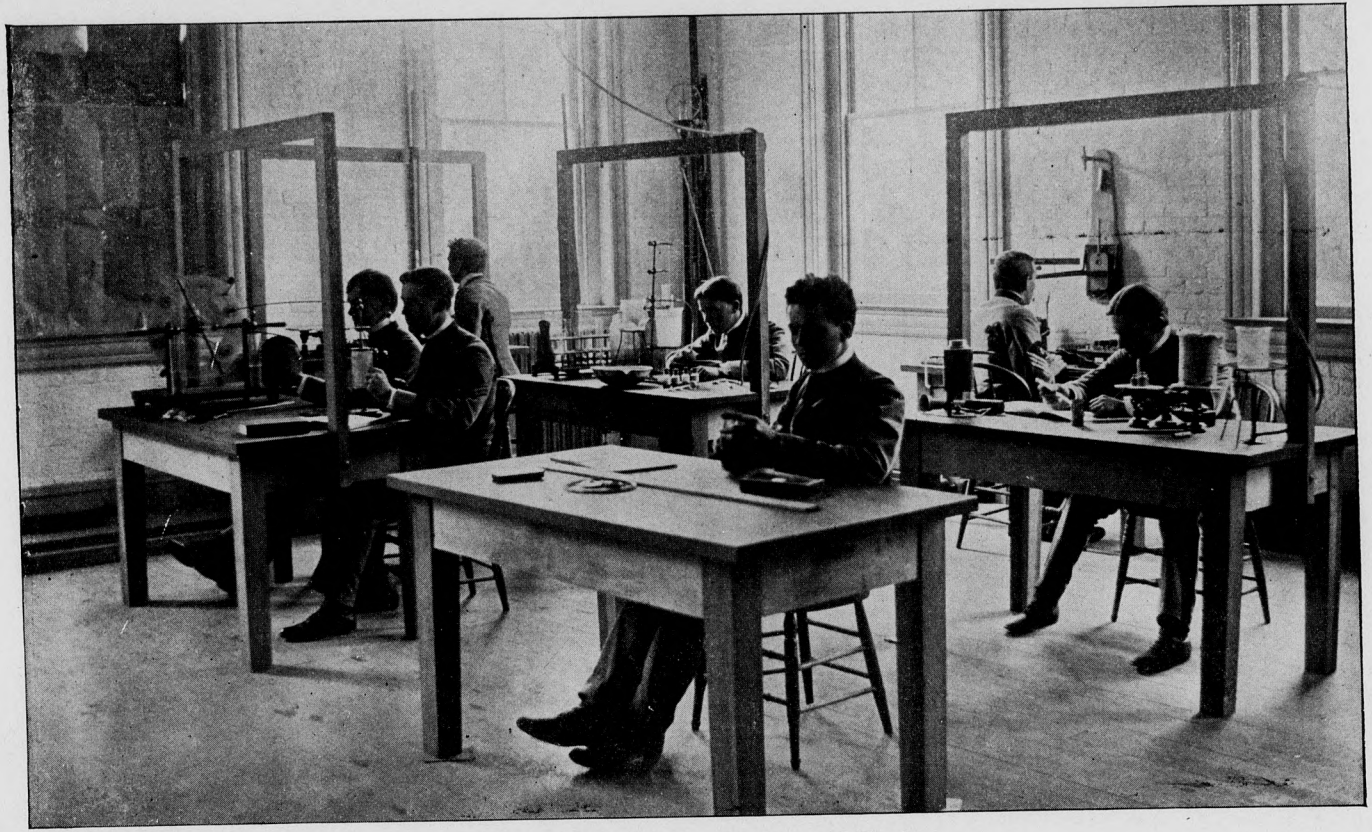

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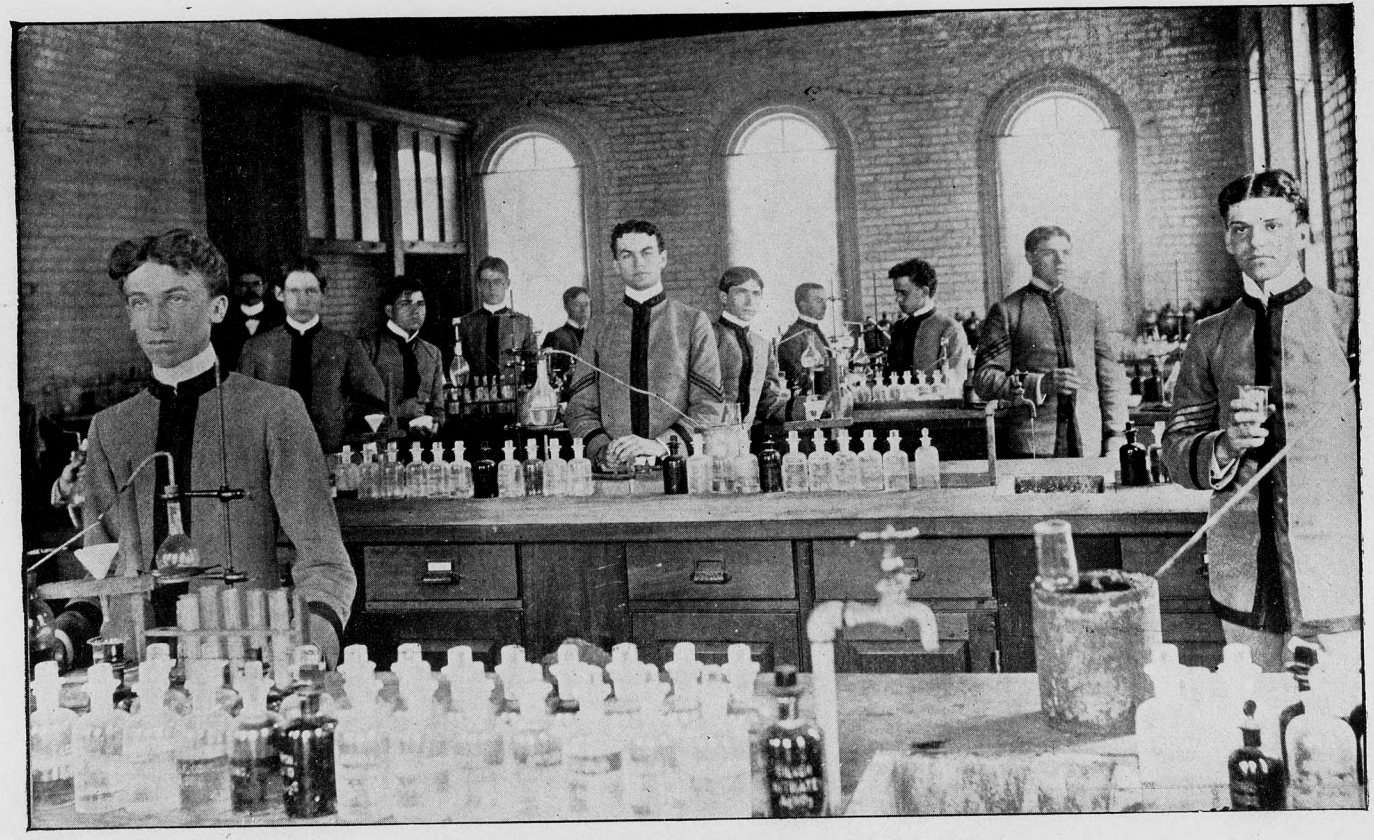

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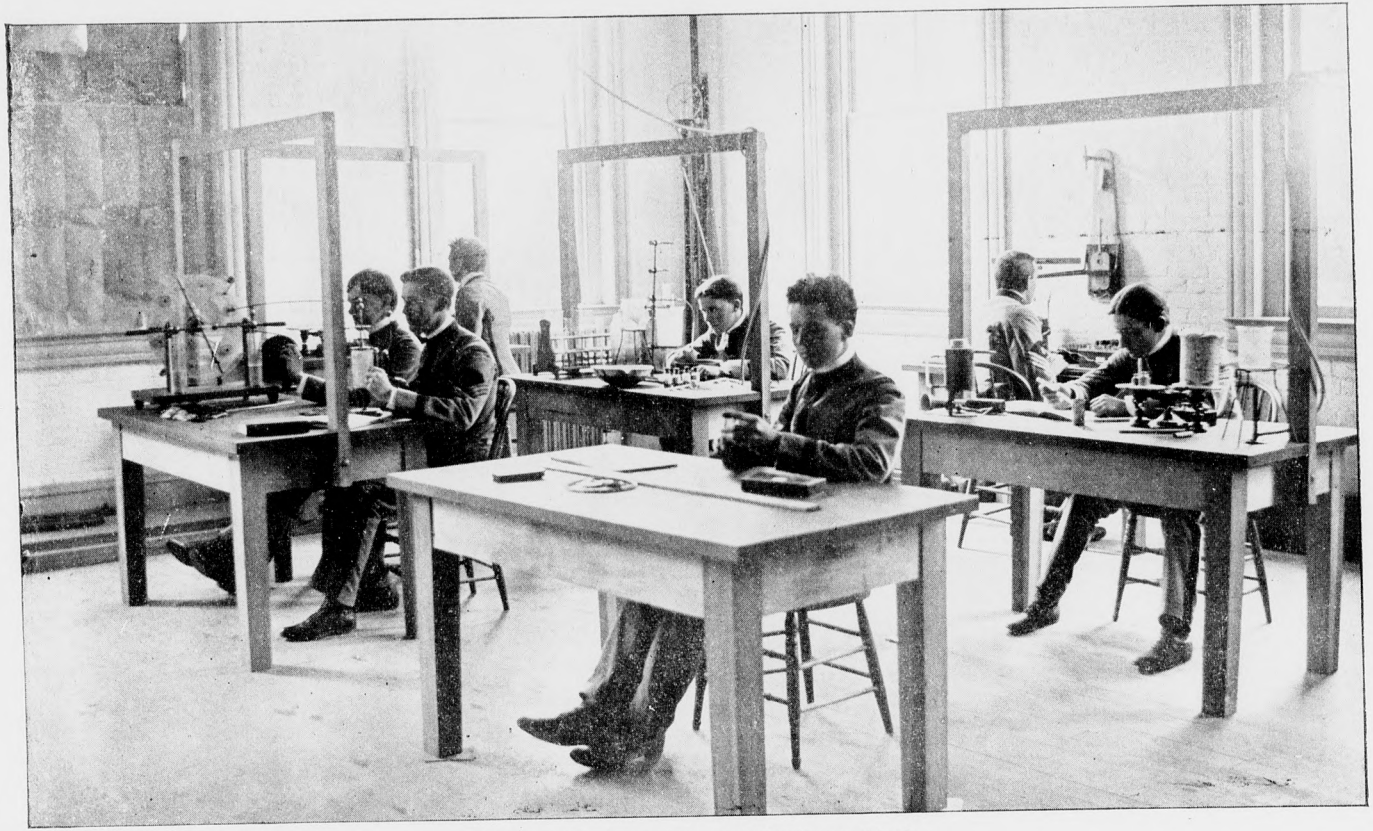

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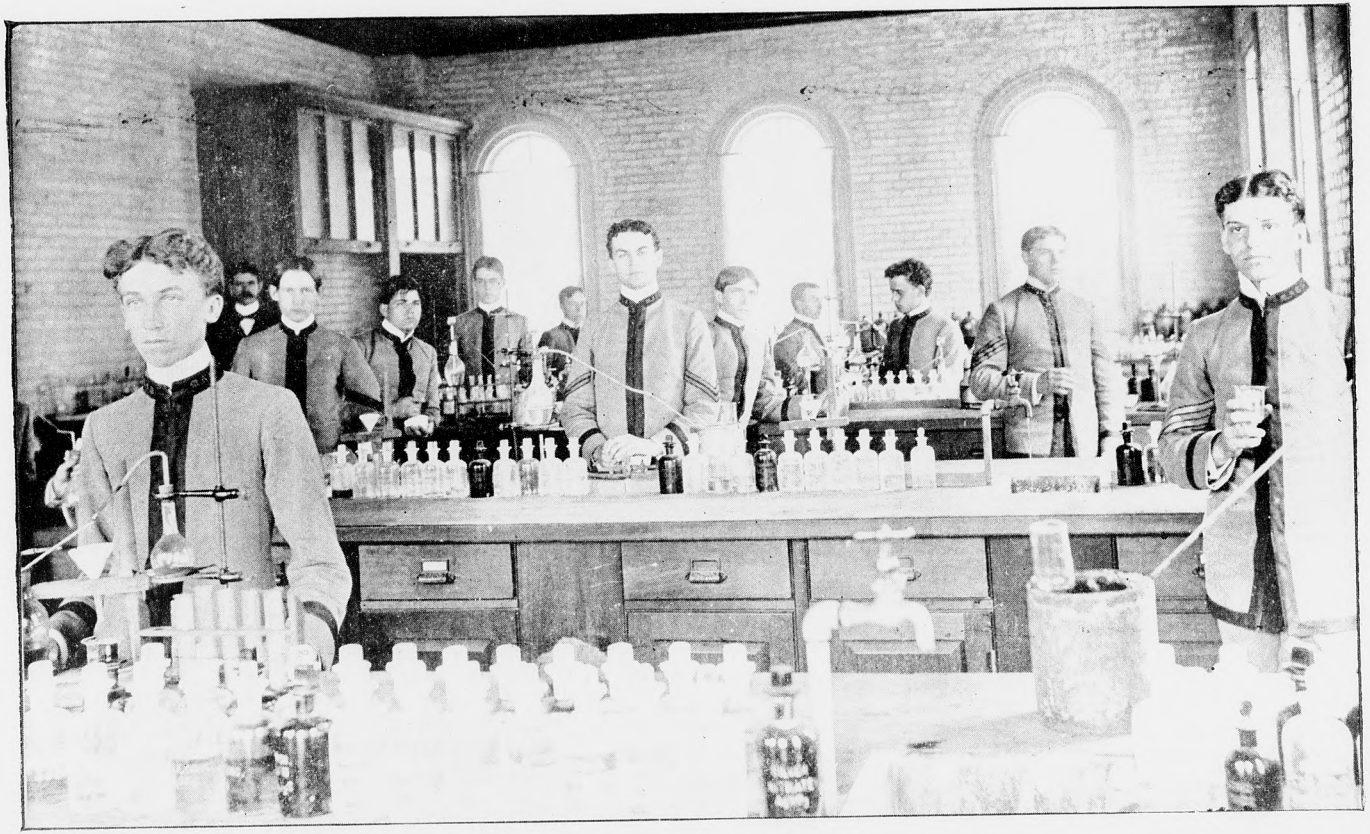

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